STANDARD FORM NO. 64

Office Memorandum • UNITED STATES GOVERNMENT

TO : The Files

DATE: 2 February 1960

FROM : [redacted] 25X1

SUBJECT: [redacted] - 28-29 January 1960 25X1

1. On 28 and 29 January 1960 a visit was made to [redacted] 25X1
[redacted] by the following personnel: 25X1
25X1

[redacted]

The following ARF personnel were in attendance at various times depending on the subject being discussed:

[redacted] 25X1
- Director of Research
ssistant Director of Research
- Assistant Director of Research
- Assistant Supervisor, Electronic Instrumentation
Supervisor, Electronic Interference
- Supervisor, Communications, Applications, and Operational Research

2. It was the original intent of the visiting personnel to only discuss a couple of subjects of interest, but it became evident that [redacted] had a multitude of capabilities and projects in areas closely related to other Agency work and interest. [redacted] is a completely self sufficient organization and is able to work in any category of the sciences. Also, the organization is set up primarily for investigation and design of the unusual and advancements in the state-of-the-art. They have no interest in production type work and do not carry any of their programs past the prototype model. They are presently doing research and development work on approximately 325 different projects, some ranging from one man year study and evaluation programs to multi-million dollar final hardware development programs. The following is a brief statement on some of the many programs that ARF is presently working on. Due to the complexity and time factor, many of the programs were not discussed in detail, but only enough information to judge if further interest was warranted was obtained. It is suggested that a round-table discussion of interested parties may be of benefit to supplement this report. 25X1 25X1 25X1

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3. The following list some of the topics and projects that were discussed:

(a) Modulator Playback Heads - The modulator playback head was discussed in some detail and appears to be a definite advancement in playback techniques. Since the output of this type head is proportional to flux rather than rate-of-change of flux, the output amplifier and wave shape is independent of the tape speed. Consequently, ratio of record to playback speeds as high as 4,000 to 1 have been achieved. The ratio limitation is presently limited to the transport design. The modulator heads also have the desirable property of relieving the requirement for equalization as needed with velocity heads, thereby reducing circuitry requirements and also giving an improved phase response.

During the discussion of the modulator heads, the [redacted] engineers pointed out that these units make excellent magnetometers. In fact, they have on occasion detected movements of demagnetized screw drivers at distances of 3 to 4 feet. Also, the opening of safe drawers has been detected at several feet. 25X1

(b) Magnetic Tape Recording and Reproducing of Video Information - A new technique for video recording and reproduction was discussed. An engineering model with response of 0 to 2.5 mc at a tape speed of 30 ips has been built. [redacted] has a proposal to refine the technique and extend upper frequency to 5 or 10 mc. This technical proposal titled "Development of Magnetic Tape Recording and Reproducing Equipment for Video Information" can be obtained upon request in the R+D section. [redacted] is interested in having someone to back further work in this field. The reason it was dropped by Aerial Reconnaissance, WADC, was that the Air Force has been sold on the technique of thermoplastic recording as offered by [redacted] and felt that magnetic recording was on its way out for high density storage. This is highly debatable. Mr. [redacted], formerly with [redacted] on the thermoplastic recording technique, stated that the thermoplastic technique still has quite a way to go before perfection, primarily in the areas of readout and difficulties in producing storage mediums. He also gave the impression that other problem areas exist, but due to his former allegiance to [redacted], he was not prone to discuss them. 25X1 25X1 25X1 25X1 25X1

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(c) Module Design - As pointed out earlier, [redacted] does not normally handle production type work, but under a special project for the Elgin Watch Company they were building up several AGC and video amplifier modules which appeared to be nicely packaged and designed. 25X1

(d) Hall Elements - [redacted] is doing extensive work in utilization and improved design of Hall elements. (Report titled "Principles and Application of Hall-Effect Devices" may be obtained upon request from the R+D section.) Some of the areas where Hall elements are presently being used at [redacted] are in modulators, parametric amplifiers, and magnetometers. Magnetic field detector now under production will have a sensitivity of 10-7 gauss. Further information for magnetic field detection may be found in the following report: "Development of Techniques for Accurate Measurements of Magnetic Fields Between 30 cps and 30 mc, Final Report - 1 May 1958-1 December 1959, Contract No. NObsr-72-7777, Index No. NE-120,000, [redacted] project No. E-103 contracted by the Bureau of Ships, Department of Navy, Washington 25, D.C. The cognizant Navy engineer is [redacted] 25X1 [redacted]. An additional item of interest was a circular ferrous loop 1 inch in diameter with a Hall element mounted on it, which when placed around a wire could detect as low as 1 microampere current in the wire anywhere from DC to 50 KC. 25X1 25X1 25X1

The Hall element output voltage is inversely proportional to the thickness of the element. Most elements at present use are 2 mils in thickness, but [redacted] is working toward reducing this thickness with a goal of possibly .2 mils, thereby improving all element characteristics. 25X1

(e) Shielded Enclosures - [redacted] is presently starting, under Navy contract, shielded room effectiveness and techniques of improvement. [redacted] reports "Revision of Standards for Attenuation Measurements of Shielded Enclosures" and "Revision of Standards for Measurements of Shielding Effectiveness of Enclosures" for further information in this area are available upon request in the R+D Section. 25X1 25X1

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(f) Missile Detection - [redacted] is studying numerous techniques for pre-launch missile detection and post-launch detection. The pre-launch detection technique presently under investigation is pointed toward detection of magnetic field disturbance resulting from positioning the missile to vertical or raising it out of the bunker. Post-launch detection is aimed toward intercepting possibly, 25X1

(1) RF energy generated by rocket exhaust
(2) Perception static
(3) The possible man-made EM environment around the rocket due to the telemetry

This work is being performed for the Signal Corps.

(g) Distant Meteorological Prediction - Presently studying techniques for detecting physical phenomena of a 2-mile cube at 50 miles distance by both active and a passive means.

(h) Antennas - A program is in work for studying ionized gas column antennas and the use of electronic scanning to replace mechanical scan.

(i) Computer and Applications and Operations Research - [redacted] has on premises a Univac 1105 digital computer. (The organizational set-up of this section is attached. As the organizational chart indicates, they can handle all phases of computer operations, programming, analysis, and maintenance.) Also of interest is the standards group which has set up standards for the computer use, thereby preventing each person who utilizes the computer from using his own techniques. The programmer, once familiar with the standards, need only send his data by mail to the computer group and will have it returned in the finished form and his presence is never required. 25X1

(j) Cross Correlation Techniques - [redacted] has not developed any equipment for cross correlation operation, but they suggested several techniques which were noted by interested parties. Reference is made to "Journal of Applied Physics" March 1957 issue. 25X1

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(k) Cartographatron - The cartographatron is an electronic plotting device which summarizes on a photographic negative any activity which has a high re-occurrence rate. It may be thought of as a densitometer which gives a visual indication of the density of an operational function over a desired area. It was developed by [redacted] in particular for origin-destination traffic surveys, but can be readily adapted to study the density of communication operations, radar activity, transportation, and correlation. (A report on the cartographatron is available in the R+D section if further information is desired.) 25X1

(l) Communications - Several studies are being conducted in the area of communications. One of interest is a study for developing techniques allowing for comparing and evaluating communications equipment. It is hoped that the results will allow accurate determination of which type communications equipment is most desirable for a particular operation; also, if new equipment actually offers an improvement in already existing sites. A second area of interest is a study for increasing the number of bits per second for the same bandwidth. [redacted] is conducting for the Signal Corps a feasibility study for a .5 mc to 40 kmc spectrum receiver. Also, under investigation is an analysis of the best methods for sending information over land lines and the amount of redundancy necessary. Communication techniques for use of AC power lines for communication purposes is being investigated at [redacted] for Civil Defense. 25X1 25X1

(m) Unconventional Power Sources - [redacted] has built machines of the 5, 10, 20, and 30 KW capacity. These machines were on the order of 1 KW per 10 lbs. Work is also being done in electrostatic generators and other unique power sources. 25X1

(n) Fiber Optics - [redacted] has under development fiber optics. Their primary purpose at the present time is for coding and decoding techniques. 25X1

(o) Transducers - [redacted] is not presently doing any development work in the area of microphones, but they utilize commercially available units. They have, in the past, conducted studies for the Air Force in using audio for 25X1

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air-to-ground communications link, and as part of this program they studied atmospheric absorption of audio frequencies. The engineer for this section could see no complications, though, in developing and designing an ultrasonic communications link for distances of 100 feet or greater and utilization of wind vibrations to modulate an ultrasonic carrier and recover it at distances of 150 feet. This would be much better than anything presently available or in study.

3. As the above would indicate, [redacted] is involved in many programs of interest to the Agency. Also, it should be pointed out that the above only touches on a few of the projects that [redacted] is presently working on. In view of the fact that [redacted] has tremendous technical capability, broad interest, work only in areas of advanced techniques, and develop only limited numbers of any item, they are suited extremely well for much of the R+D activity of this organization. The Agency has a basic contract and cleared personnel with [redacted]. 25X1 25X1 25X1

[redacted]

Attachments:
1. List of Computer Applications
2. Organizational Chart

Distribution:
R+D Subject File w/attachments
R+D Lab w/o attachments
SPS/AF w/o attachments
Monthly (2) w/o attachments
EP Chrono w/o attachments

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TECHNICAL AREAS

COMPUTER APPLICATIONS AND OPERATIONS RESEARCH

Contract Research & Development

PROBLEM ANALYSIS AND PROGRAMMING FOR DIGITAL COMPUTATION
- Engineering and scientific calculations
- Simulation of complex systems
- Management science calculations

OPERATIONS RESEARCH AND STATISTICS
- Design of experiments
- Analytical statistics
- Probabilistic modeling
- Information system studies
- Game and queuing theory

MATHEMATICAL PROGRAMMING RESEARCH
- Network optimization studies
- Theory of computing algorithms
- Linear and nonlinear programming
- Dynamic programming
- Statistical decision processes
- Learning theory

UNIVAC 1105 SYSTEM STANDARDS
- Programming systems and operating standards
- Foundation staff training
- Maintenance of subroutine library
- Automatic programming system development

UNIVAC 1105 MAINTENANCE ENGINEERING

UNIVAC 1105 SYSTEM OPERATION

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